

FEDERAL TRADE COMMISSION

WASHINGTON, D. C. 20580

BUREAU OF  
CONSUMER PROTECTION

February 2, 1982

Ernest Pepples  
Senior Vice President  
and General Counsel  
Brown and Williamson Tobacco  
Corporation  
1600 West Hill Street  
P.O. Box 35090  
Louisville, Kentucky 40232

Dear Mr. Pepples:

Enclosed is a page which was inadvertently omitted from our last circulation. The page should be inserted in the submission entitled Puff Parameter Analyzer, Philip Morris, U.S.A., Research Center, Engineering Services Division, August 14, 1981. This is the second page of text, and should be inserted after the page headed BACKGROUND AND DESIGN CRITERIA.

Secondly, we have received a request from one company that the February 15 submissions be circulated among the six companies, as per our agreement for the other submissions. The company maintains that circulation of the February 15 submissions will facilitate preparation of comments on the consultants' reports. Please notify me as to your company's response to this request.

Sincerely,



Andrew Sacks

Attorney

Division of Advertising Practices

ENCLOSURE PREVIOUSLY MAILED

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$$\frac{\Delta P}{L} = \frac{3 \times 10^{-3}}{d^5} F \quad \text{in H}_2\text{O column} \quad \{1\}$$

in.

$$Re = \frac{0.05526}{d} F \quad (\text{Dimensionless}) \quad \{2\}$$

$$L_e = 0.0575 Re \text{ inches} \quad \{3\}$$

where  $\Delta P$  = Pressure drop between taps, inches of water column

$L$  = Length of tubing between taps, inches

$d$  = Inside diameter of tubing, inches

$F$  = Flow rate  $\text{cm}^3/\text{min.}$  of ambient air

$L_e$  = Entrance length required to develop laminar flow

$Re$  = Reynolds number =  $\frac{du\rho}{\mu}$

$u$  = Gas velocity }

$\rho$  = Gas density } All consistent for dimensionless  $Re$

$\mu$  = Gas viscosity }

When Reynolds number,  $Re$ , is less than about 2100, flow is laminar. The differential pressure sensor chosen (Validyne DP 103 - .01 psid) has a range of  $\pm 0.01$  psid or  $\pm 0.277$  inches of water column. Selecting standard  $1/4"$  outside diameter tubing with  $0.035"$  walls yields an inside diameter of  $0.18"$ . The maximum flow rate selected was  $5000 \text{ cm}^3/\text{min.}$ , the distance between pressure taps  $6.5"$ , and under these conditions, flow equations {1}, {2}, and {3} yield the following:

$$\Delta P = (6.5) (3.10^3) (5000) (0.18)^{-5} = 0.093" \text{ of water column}$$

$$Re = (0.05526) (5000) (0.18)^{-1} = 1535 < 2100 \therefore \text{laminar flow}$$

$$L_e = (0.05526) (1535) (0.18) = 15.88"$$

Forming the entrance length tubing into a coil  $2.5"$  in diameter showed no effect on the linearity of the sensor tube-pressure transducer combination, and this approach was used to reduce the size of the instrument.

Linearity of the sensor tube pressure transducer response to constant volumetric flows was measured to be  $\pm 1$  percent of full scale (i.e.  $\pm 50 \text{ cm}^3/\text{min.}$ ) With each sensor similarly calibrated to produce flow-proportional electrical signals, and with the digital integration and display hardware in place, all that remained was to verify the accuracy of dynamic measurements.

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Identical letters (not attached) were sent to:

2. Arthur J. Stevens, Lorillard  
Michael Gastman, Lorillard
3. Arnold Henson, American Brands
4. Samuel B. Witt III, RJR
5. Joseph H. Greer, Liggett

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